

## CLAIMS

We claim:

- 1        1.    Method for evaluating a network, comprising the steps  
2        of:  
  
3            measuring average message delay through said network;  
  
4            determining the standard deviation of said message  
5            delay; and  
  
6            calculating the discrete utilization of said network as  
7            the ratio of said average message delay to said  
8            standard deviation.
- 1        2.    The method of claim 1, further comprising the steps of:  
  
2            factoring instances of dropped messages as full  
3            utilization in calculating said discrete utilization.

1 3. Method for evaluating a network, comprising the steps  
2 of:

3 communicating of a plurality of long packets and short  
4 packets through said network;

5 determining the best time of said long packets;

6 determining the best time of said short packets;

7 responsive to the length of said long and short packets  
8 and their respective best times, determining network  
9 Network Queue Wait Time (Tw) and the Standard Deviation  
10 of Network Queue Wait Time, ( $\sigma Tw$ );

11 responsive to said Tw and  $\sigma Tw$ , calculating the discrete  
12 utilization (p) of said network.

1 4. The method of claim 3, wherein said Tw,  $\sigma Tw$  and p are  
2 related by the expression:

3  
4 
$$Tw / \sigma Tw = p / \sqrt{(p * (2 - p))} .$$

1        5.    Method for evaluating a network, comprising the steps  
2        of:  
  
3        sending test packets across said network;  
  
4        responsive to said test packets, deducing the capacity  
5        of said network, its latency, and the current  
6        utilization of said capacity.

1        6.    The method of claim 5, further comprising the steps of:  
  
2        calculating network hop count as a measure of the  
3        minimum number of hops of network bottleneck hop speed  
4        that could be in the actual network; and  
  
5        responsive to said network hop count, determining the  
6        minimum network discrete utilization.

1        7.    The method of claim 6, further comprising the steps of:  
  
2        responsive to said test packets, determining as a  
3        maximum network discrete utilization the number of

4           messages queued per network hop count; and

5           responsive to said minimum network discrete utilization

6           and said maximum network discrete utilization,

7           determining a best approximation of end to end discrete

8           utilization.

1       8.    The method of claim 7, further comprising the step of:

2           adjusting said end to end discrete utilization for

3           dropped test packets.

1       9.    The method of claim 7, said best approximation of end

2           to end discrete utilization being the average of said

3           minimum network discrete utilization and said maximum

4           network discrete utilization.

1       10.   The method of claim 7, further comprising the step of:

2           adjusting said best approximation of end to end

3           discrete utilization by selectively weighting said

4 minimum network discrete utilization or said maximum  
5 network discrete utilization responsive to network  
6 streaming utilization.

1 11. A method for evaluating network characteristics,  
2 comprising the steps of

3 determining network utilization;

4 determining average message service time; and

5 calculating the standard deviation of network queue  
6 wait time ( $\sigma Tw$ ) = square root of (utilization \* (2-  
7 utilization)) \* (average message service time / (1 -  
8 utilization)).

1 12. The method of claim 11, further comprising the step of  
2 determining  $Tw = \text{utilization} * \text{average message service}$   
3  $\text{time} / (1 - \text{utilization})$ .

1 13. A method for evaluating the discrete utilization of a  
2 network, comprising the steps of

3 transmitting through said network and time stamping  
4 probative samples; and

5 responsive to said samples, calculating the average  
6 wait time and the standard deviation of average delay  
7 of said network.

1 14. The method of claim 13, said samples comprising one way  
2 echo packets.

1 15. The method of claim 13, said samples comprising two way  
2 echo packets.

1 16. The method of claim 13 for deriving the discrete  
2 utilization of a network, further comprising the steps of:

3 deriving said discrete utilization as the ratio of the  
4 wait time of said network to the standard deviation of

5 the average queue wait time.

1 17. The method of claim 16, further comprising the  
2 steps of:

3 fine tuning said discrete utilization by averaging  
4 dropped instances of said samples with successful  
5 transmissions of said samples to derive a measure of  
6 discrete utilization based upon a total set of said  
7 probative samples.

1 18. System for evaluating a network, comprising:

2 an apparent network speed analysis application for  
3 measuring average message delay through said network;  
4 determining the standard deviation of said message  
5 delay; and

6 calculating the discrete utilization of said network as  
7 the ratio of said average message delay to said  
8 standard deviation; and

9 a service level and capacity planning routine for  
10 tuning said network.

1 19. The system of claim 18, said service level and capacity  
2 planning routine further for calculating change in network  
3 traffic before network response time service level is  
4 compromised; determining additional file load capacity of  
5 the network; and adjusting window size for file transfer to  
6 fill remaining capacity.

1 20. System for evaluating a network, comprising:

2 a first program module for measuring average message  
3 delay through said network;

4 a second program module for determining the standard  
5 deviation of said message delay; and

6 a third program module for calculating the discrete  
7 utilization of said network as the ratio of said  
8 average message delay to said standard deviation.



1 21. A program storage device readable by a machine,  
2 tangibly embodying a program of instructions executable by a  
3 machine to perform method steps for evaluating a network,  
4 said method steps comprising:

5 measuring average message delay through said network;

6 determining the standard deviation of said message  
7 delay; and

8 calculating the discrete utilization of said network as  
9 the ratio of said average message delay to said  
10 standard deviation.

1 22. A computer program product or computer program element  
2 for performing the steps of:

3 measuring average message delay through said network;

4 determining the standard deviation of said message  
5 delay; and

6 calculating the discrete utilization of said network as

7 the ratio of said average message delay to said  
8 standard deviation.

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